PATENT SPECIFICATION 968,507

DRAWINGS ATTACHED.

968,507

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COMPLETE SPECIFICATION.

Improvements in or relating to Linings for Hollow Charge Projectiles.

We, RHEINMETALL G.m.b.H., a Company recognised by German law, of Rather Strasse 110, Dusseldorf, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

The invention relates to linings for hollow charge projectiles.

As is well known, the armour-breaking or piercing effect of a hollow charge is increased by a lining. It is also known to achieve special effects of improved performance by shaping and dimensioning the lining in a particular way. Thus it is known, for example, that a circular-cone lining whose wall thickness increases from the point towards the base produces a better effect at the target under certain conditions than circular-cone linings of uniform wall thickness. Furthermore it is known to improve the effect of such linings by bottle-shaped, semi-spherical or geometrically similar configurations.

All the measures with respect to shaping the lining make its production more difficult and time-wasting the more complex its shape becomes. On the other hand, experience has shown that it is only possible to repeat the aimed-at effect with the necessary reliability if the special shape of the lining, i.e. its geometrical configuration, wall thickness etc. which had been experimentally established, for example in a proto-type, as being the correct shape, is maintained with the utmost accuracy in mass production. Even small dimensional variations from the theoretical values of dimension or shape may lead to a noticeable falling off in performance. In short, the production of the lining has to be carried out with particular care if the best uniform results and piercing effects are to be obtained by the finished charge or a projectile associated therewith. Yet, these demands cannot be easily met within the scope of economic mass production as far as conventional homogeneous linings, particularly those made of metal by conventional production methods such as deep drawing, stamping etc., are concerned.

The present invention has for its object the provision of a particularly economical production of such hollow charge linings whereby, *inter alia*, it is also ensured that linings even of complex shape can be manufactured with uniform accuracy and, at the same time, with a great saving of production time.

According to the present invention a hollow charge projectile has a lining which consists of a plastics material reinforced with glass fibre.

In one particular embodiment of the invention the glass fibre reinforcement is prestressed, the prestressing being generally similar to that used in the manufacture of reinforced concrete.

The basic material from which the lining is made may contain incendiary materials, for example, magnesium powder.

It lies within the scope of this invention to aim at special effects, for example by adding to the basic lining material powderized heavy metals—preferably as ingredients. In this way an increase of the specific weight of the lining can easily be achieved.

Instead of the above-mentioned powderized metallic additions, also powderized non-metallic substances of high specific weight, for example, heavy spar may be employed according to the invention.

Some embodiments of the invention are illustrated in the accompanying drawings :—

Figure 1 illustrates a longitudinal section of a hollow charge lining as proposed by the invention, of circular-cone shape, in which the wall thickness increases from the point towards the base ;

Figure 2 illustrates a second cap-shaped configuration, showing a lining in longitudinal section, in which the wall thickness also increases from the point towards the base ;

Figure 3 illustrates a bottle-shaped lining in longitudinal section ;

Figure 4 illustrates a hollow-charge projectile in longitudinal section with a lining in the shape of a stepped cone ; and

Figure 5 is a cross-section in the direction of arrows A—B of Figure 4.

In the examples of Figures 1, 2 and 3, the basic lining element is denoted by the reference numeral 1 and consists of a synthetic material based on a polyester in which is embedded glass silk tissue 2. In Figures 1 and 2, the lining is of cone-like shape and the wall thickness of the lining increases from the apex of the cone towards the base. Figure 3 shows a lining 1, made from similar material with a glass silk tissue 2 embedded therein, the whole lining having been given the shape of a bottle. In this embodiment the wall thickness is substantially constant from top to bottom.

Figure 4 shows a longitudinal section, in diagrammatic representation, of a rotationally stabilized hollow-charge projectile with a casing or envelope 3, an explosive charge 4, primer 5, and a hollow charge lining 6. The latter is shaped as a stepped cone and has, as shown, a wall thickness which increases from the apex of the cone towards its base. This stepped shape of the lining has the effect that, upon detonation of the explosive charge, a tangential component of movement is imparted to the explosion products which is substantially equal, although opposed, to the tangential component of movement produced by the rotation of the projectile. In this way the detrimental effect of the projectile's rotation on the performance of the hollow charge will be compensated, by giving the hollow charge lining a particular shape. Here, too, the hollow charge lining whose shape is somewhat more complex consists of a basic element 2 of plastic material, the latter being reinforced by strands or a tissue of glass silk. As the lining is made of plastic material it can be easily produced to accurate shape even in mass production. Accordingly, liners can be made with minimum deviations from theoretical values and a specific rigidity equal if not superior to that of steel.

WHAT WE CLAIM IS :—

1. A hollow charge projectile having a lining consisting of a plastics material reinforced with glass fibre.

2. A projectile as claimed in Claim 1 in which the glass fibre reinforcement is prestressed.

3. A projectile as claimed in Claim 1 or 2 in which the basic material of the lining contains pulverulent heavy metal or metals or a pulverulent heavy non-metallic substance or substances.

4. A projectile as claimed in Claim 3 in which the pulverulent heavy non-metallic substance is heavy spar.

5. A projectile as claimed in any one of Claims 1—4 in which the basic material of the lining contains incendiary materials.

6. A projectile as claimed in Claim 5 in which the incendiary material is magnesium powder.

7. A hollow charge projectile having a lining substantially as described with reference to and as illustrated by Figure 1, 2 or 3 of the accompanying drawings.

8. A hollow charge projectile substantially as described with reference to and as illustrated by Figures 4 and 5 of the accompanying drawings.

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Reference has been directed in pursuance of Section 9, subsection (1) of the Patents Act, 1949, to Patent No. 924,467.

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Fig. 1

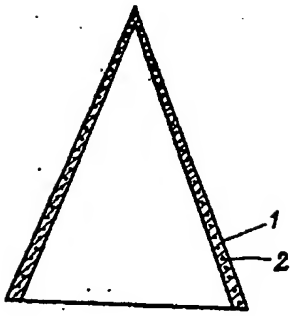


Fig. 2

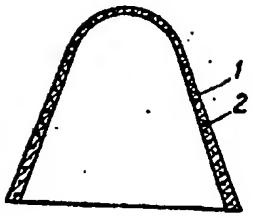
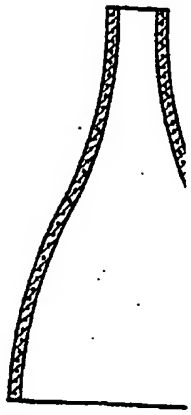


Fig.



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Sheets 1 & 2

ig. 1

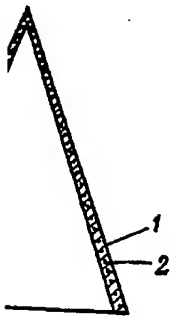

Fig. 3

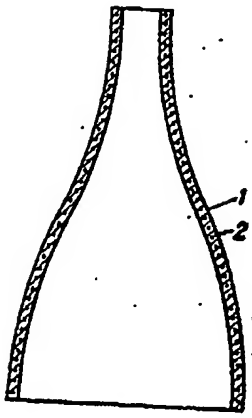

Fig. 4

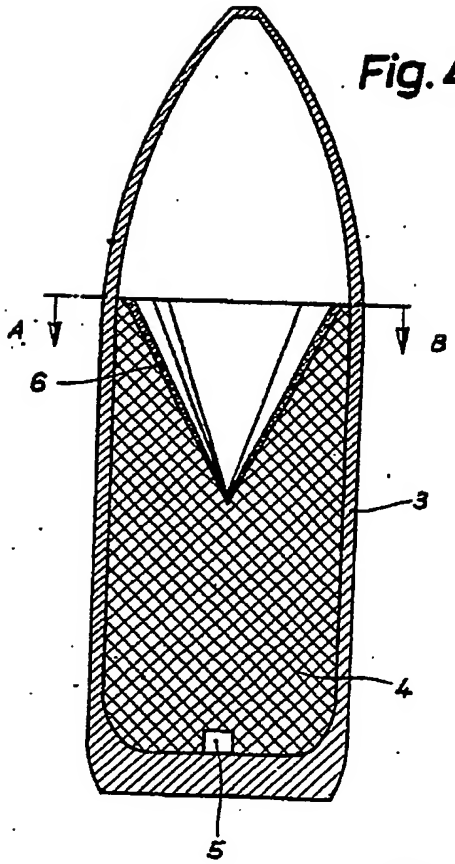

Fig. 5
A-B

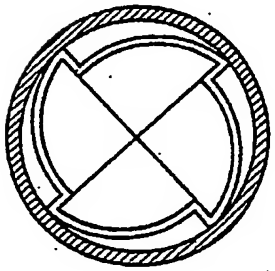

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Fig.1

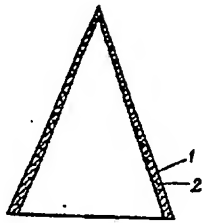

Fig.2

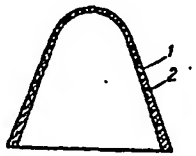

Fig.3

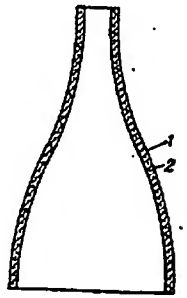

Fig.4

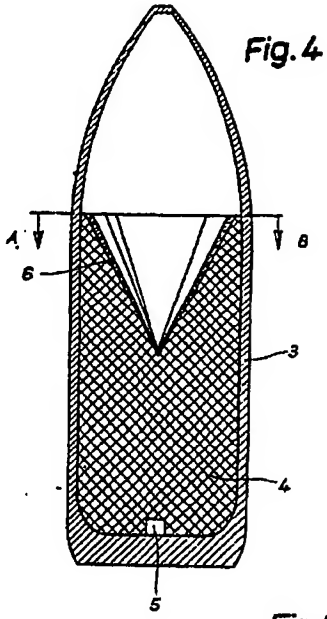

Fig.5
A-B